

# Linux Multi-Queue Block IO Queueing Mechanism (blk-mq)

blk-mq (Multi-Queue Block IO Queueing Mechanism) is a new framework for the Linux block layer that was introduced with Linux Kernel 3.13 and has become feature-complete with Kernel 3.16. Blk-mq allows for over 15 million IOPS with high-performance flash devices (e.g. PCIe SSDs) on multi-socket servers, though even single and dual socket servers also benefit considerably from blk-mq. To use a device with blk-mq, the device must support the respective driver.

## Overview of blk-mq

Blk-mq integrates into the storage stack and provides basic functions to device drivers for mapping I/O enquiries to multiple queues.

The tasks are distributed across multiple threads and therefore to multiple CPU cores (per-core software queues).

Blk-mq compatible drivers request count for parallel hardware queues a device supports.

All device drivers that use the previous block I/O layer continue to work independently of blk-mq.



**blk-mq-based** device drivers bypass the previous Linux I/O scheduler.

## Device Drivers

Driver	Device Name	Supported Devices
null_blk	/dev/nullb*	none (test drivers)
virtio-blk	/dev/vd*	Virtual guest drivers
mtip32xx	/dev/rssd*	Micron RealSSD PCIe
scsi (scsi_mq)	/dev/sd*	e.g. SAS and SATA SSDs/HDDs
NVMe	/dev/nvme*	e.g. Intel SSD DC P3600 DC P3700 Series
rbd	/dev/rdb*	RADOS Block Device (Ceph)
ubi/block	/dev/ubiblock*	
loop	/dev/loop*	Loopback-Device
dm / dm-mpath		

## Enable blk-mq

Enabling blk-mq must happen at boot time. You need to add **scsi\_mod.use\_blk\_mq=1** to your [lilo.conf](#)

[/etc/lilo.conf](#)

```
# LILO configuration file
# generated by 'liloconfig'
#
# Start LILO global section
# Append any additional kernel parameters:
append=" scsi_mod.use_blk_mq=1"
```



Enabling `blk_mq` makes it impossible to use non `blk_mq` schedulers. You lose `noop cfq` and the non mq `deadline`

## Automatic IO scheduler selection

udev rules can be used to select IO schedulers for different device types.

[/etc/udev/rules.d/60-ioscheduler.rules](#)

```
# set deadline scheduler for non-rotating disks
ACTION=="add|change", KERNEL=="sd[a-z]", TEST!="queue/rotational",
ATTR{queue/scheduler}="deadline"
ACTION=="add|change", KERNEL=="sd[a-z]", ATTR{queue/rotational}=="0",
ATTR{queue/scheduler}="bfq"

# set cfq scheduler for rotating disks
ACTION=="add|change", KERNEL=="sd[a-z]", ATTR{queue/rotational}=="1",
ATTR{queue/scheduler}="cfq"
```

## Sources

- \* Originally written by [lamerix](#)
- \* Source [https://www.thomas-krenn.com/en/wiki/Linux\\_Multi-Queue\\_Block\\_IO\\_Queueing\\_Mechanism\\_\(blk-mq\)](https://www.thomas-krenn.com/en/wiki/Linux_Multi-Queue_Block_IO_Queueing_Mechanism_(blk-mq))
- \* Source <http://kernel.dk/blk-mq.pdf>
- \* Source <https://lwn.net/Articles/552904/>

[howtos](#), [blk-mq](#), [multi-queue](#), [io](#), author [lamerix](#)

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Last update: **2018/08/21 12:10 (UTC)**

